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1. A product comprising a substrate to which is chemically bonded a monolayer of silicon atoms which are connected to other silicon atoms in said monolayer through oxygen atoms in said monolayer, wherein the monolayer is substituted with first and second hydrocarbyl substituents and each of the silicon atoms in said monolayer is substituted with said first hydrocarbyl substituent or said second hydrocarbyl substituent, wherein said first hydrocarbyl substituent is longer than said second hydrocarbyl substituent.

2. The product of Claim 1 wherein said first and second hydrocarbyl substituents are distributed essentially uniformly on said substrate.

3. The product of Claim 1 wherein said first hydrocarbyl substituent is selected from the group consisting of phenyl, alkyl containing 1 to 60 carbon atoms, monounsaturated alkylene containing 2 to 60 carbon atoms, epoxide, and derivatives of alkyl or monounsaturated alkylene which contain a total of up to 60 carbon atoms and which contain one or more hetero linkages selected from the group consisting of -O-, -N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-, -C(O)N(R)-, or -N(R)C(O)-; wherein the phenyl, alkyl, and alkylene are optionally substituted with one or more substituents selected from the group consisting of hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R), straight or branched alkyl containing 1 to 6 carbon atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup> and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6 carbon atoms, and R in each occurrence is hydrogen or alkyl containing 1 to 6 carbon atoms.

1           4. The product of Claim 1 wherein said  
second hydrocarbyl substituent is selected from the  
group consisting of phenyl, alkyl containing 1 to 60  
carbon atoms, monounsaturated alkylene containing 2 to  
5 60 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
10 -C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
15 atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

20           5. The product of Claim 1 wherein the mole  
ratio of said first hydrocarbyl substituent to said  
second hydrocarbyl substituent on said substrate is  
100:1 to 1:100.

25           6. A product according to Claim 1 wherein  
the surface of said substrate comprises an inorganic  
element or an oxide thereof, which is capable of forming  
a bond to silicon atoms in said monolayer.

30           7. A product according to Claim 6 wherein  
said inorganic element is selected from the group  
consisting of Si, Al, Zr, P, Be, Mg, Ti, Al, V, Cr, Mn,  
Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Rb, Sr, Y, Nb, Mo, Ru,  
Rh, Pt, Au, Ag, Tl, Pb and Bi.

- ~~6~~ 1 ~~8.~~ A product according to Claim ~~8~~ wherein  
the surface of said substrate comprises Al.
- ~~7~~ ~~9.7~~ A product according to Claim ~~8~~ wherein  
the surface of said substrate comprises Be.
- ~~5~~ ~~10.8~~ A product according to Claim ~~8~~ wherein  
the surface of said substrate comprises Ti.
- ~~11.9~~ A product according to Claim ~~8~~ wherein  
the surface of said substrate comprises Zr.
- ~~12~~ ~~10~~ A product according to Claim ~~11~~ wherein  
said first hydrocarbyl substituent has the formula  
 $\text{HOCH}_2\text{-CH(OH)CH}_2\text{-}$ .
- ~~13.11~~ A product according to Claim 1 wherein  
said substrate is bonded to the silicon atoms in said  
monolayer through oxygen atoms.
- 15 14. A product according to Claim 1 comprising  
silica gel to which is chemically bonded a protective  
monolayer of silicon atoms which are connected to other  
silicon atoms in said monolayer through oxygen atoms in  
said monolayer, wherein the monolayer is substituted  
20 with first and second hydrocarbyl substituents and each  
of the silicon atoms in said monolayer is substituted  
with said first hydrocarbyl substituent or said second  
hydrocarbyl substituent, wherein said first hydrocarbyl  
substituent is longer than said second hydrocarbyl  
25 substituent.
15. The product of Claim 14 wherein said  
first and second hydrocarbyl substituents are  
distributed essentially uniformly on said substrate.
16. The product of Claim 14 wherein said  
30 first hydrocarbyl substituent is selected from the group  
consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60

1 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
linkages selected from the group of consisting of -O-,  
5 -N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
10 straight or branched alkyl containing 1 to 6 carbon  
atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

15 17. The product of Claim 14 wherein said  
first hydrocarbyl substituent is selected from the group  
consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60  
carbon atoms, epoxide, and derivatives of alkyl or  
20 monounsaturated alkylene containing a total of up to 60  
carbon atoms and which contain one or more hetero  
linkages selected from the group of consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
25 and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
30 and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

1           18. The product of Claim 14 wherein the mole  
ratio of said first hydrocarbyl substituent to said  
second hydrocarbyl substituent on said substrate is  
100:1 to 1:100.

5           19. The product of Claim 14 wherein said  
first hydrocarbyl substituent contains 2 to 24 carbon  
atoms.

10           20. The product of Claim 14 wherein said  
second hydrocarbyl substituent contains 1 to 6 carbon  
atoms.

21. The product of Claim 14 wherein said  
first hydrocarbyl substituent is octadecyl and said  
second hydrocarbyl substituent is propyl.

15           22. The product of Claim 14 wherein said  
first hydrocarbyl substituent is octadecyl and said  
second hydrocarbyl substituent is methyl.

23. The product of Claim 14 wherein said  
first hydrocarbyl substituent is octyl and said second  
hydrocarbyl substituent is methyl.

20           24. The product of Claim 14 wherein said  
first hydrocarbyl substituent is butyl and said second  
hydrocarbyl substituent is methyl.

25           25. The product of Claim 14 wherein said  
first hydrocarbyl substituent occupies about 20 to about  
50% of the surface of said substrate.

26. The product of Claim 14 wherein the mole  
ratio of said first hydrocarbyl substituent to said  
second hydrocarbyl substituent is about 1:1 to about  
1:4.

30           <sup>12</sup>  
27. In the method of chromatographically  
separating a mixture of substances using a chromato-

B 1 graphic material, the improvement wherein said material  
is a product according to Claim 8.

28. In the method of chromatographically  
separating a mixture of substances using a chromato-  
5 graphic material, the improvement wherein said material  
is a product according to Claim 7.

29. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
10 is a product according to Claim 14.

30. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
is a product according to Claim 15.

15 31. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
is a product according to Claim 16.

32. In the method of chromatographically  
20 separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
is a product according to Claim 17.

33. In the method of chromatographically  
separating a mixture of substances using a chromato-  
25 graphic material, the improvement wherein said material  
is a product according to Claim 18.

34. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
30 is a product according to Claim 19.

35. In the method of chromatographically  
separating a mixture of substances using a chromato-

1 graphic material, the improvement wherein said material  
is a product according to Claim 20.

36. In the method of chromatographically  
separating a mixture of substances using a chromato-  
5 graphic material, the improvement wherein said material  
is a product according to Claim 21.

37. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
10 is a product according to Claim 25.

38. In the method of chromatographically  
separating a mixture of substances using a chromato-  
graphic material, the improvement wherein said material  
is a product according to Claim 26.

15 39. A product according to Claim 1 comprising  
a glass surface to which is chemically bonded a  
protective monolayer of silicon atoms which are  
connected to other silicon atoms in said monolayer  
through oxygen atoms in said monolayer, wherein the  
20 monolayer is substituted with first and second  
hydrocarbyl substituents and each of the silicon atoms  
in said monolayer is substituted with a first  
hydrocarbyl substituent or a second hydrocarbyl  
substituent, wherein said first hydrocarbyl substituent  
25 is longer than said second hydrocarbyl substituent.

40. The product of Claim 39 wherein said  
first and second hydrocarbyl substituents are  
distributed essentially uniformly on said substrate.

41. The product of Claim 39 wherein said  
30 first hydrocarbyl substituent is selected from the group  
consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60

- 1 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
linkages selected from the group of consisting of -O-,  
5 -N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
10 straight or branched alkyl containing 1 to 6 carbon  
atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.
- 15 42. The product of Claim 39 wherein said  
second hydrocarbyl substituent is selected from the  
group consisting of phenyl, alkyl containing 1 to 60  
carbon atoms, monounsaturated alkylene containing 2 to  
60 carbon atoms, epoxide, and derivatives of alkyl or  
20 monounsaturated alkylene containing a total of up to 60  
carbon atoms and which contain one or more hetero  
linkages selected from the group of consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
25 and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
30 and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.



1           43. The product of Claim 39 wherein the mole  
ratio of said first hydrocarbyl substituent to said  
second hydrocarbyl substituent on said substrate is  
100:1 to 1:100.

5           44. The product of Claim 39 wherein said  
first hydrocarbyl substituent contains 2 to 24 carbon  
atoms.

10           45. The product of Claim 39 wherein said  
second hydrocarbyl substituent contains 1 to 6 carbon  
atoms.

          46. The product of Claim 39 wherein said  
first hydrocarbyl substituent is octadecyl and said  
second hydrocarbyl substituent is propyl.

15           47. The product of Claim 39 wherein said  
first hydrocarbyl substituent occupies about 20 to about  
50% of the surface of said substrate.

20           48. The product of Claim 39 wherein the mole  
ratio of said first hydrocarbyl substituent to said  
second hydrocarbyl substituent is about 1:1 to about  
1:4.

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resistant to chemical and mechanical degradation which  
comprises forming on said surface a protective monolayer  
of silicon atoms which are connected to other silicon  
atoms in said monolayer through oxygen atoms in said  
monolayer, wherein the monolayer is substituted with  
first and second hydrocarbyl substituents and each of  
the silicon atoms in said monolayer is substituted with  
a first hydrocarbyl substituent or a second hydrocarbyl  
30           substituent, wherein said first hydrocarbyl substituent  
is longer than said second hydrocarbyl substituent.

14  
50. The method of Claim 49<sup>13</sup> wherein said first  
hydrocarbyl substituent is selected from the group  
consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60  
5 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
10 -C(O)N(R)-, or -N(R)C(O)-; wherein the phenyl, alkyl,  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
15 atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

51<sup>15</sup> The method of Claim 49<sup>13</sup> wherein said  
20 second hydrocarbyl substituent is selected from the  
group consisting of phenyl, alkyl containing 1 to 60  
carbon atoms, monounsaturated alkylene containing 2 to  
60 carbon atoms, epoxide and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
25 60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
and alkylene are optionally substituted with one or more  
30 substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon

1 atoms, and  $-R^1Si(R^2)_{3-n}(OH)_n$  wherein n is 1, 2 or 3,  $R^1$   
and  $R^2$  are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

5 52. The method according to Claim 49 wherein  
material having a glass surface is rendered resistant to  
chemical and mechanical degradation of said surface.

53. The method of Claim 52 wherein said first  
hydrocarbyl substituent is selected from the group  
10 consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60  
carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
15 linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, or -N(R)C(O)-; wherein the phenyl, alkyl,  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
20 hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and  $-R^1Si(R^2)_{3-n}(OH)_n$  wherein n is 1, 2 or 3,  $R^1$   
and  $R^2$  are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
25 alkyl containing 1 to 6 carbon atoms.

54. The method of Claim 52 wherein said  
second hydrocarbyl substituent is selected from the  
group consisting of phenyl, alkyl containing 1 to 60  
carbon atoms, monounsaturated alkylene containing 2 to  
30 60 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to

1 60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
-C(O)N(R)-, and -N(R)C(O)-; wherein the phenyl, alkyl  
5 and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro, -COOH, -SO<sub>3</sub>H, -N(R)(R),  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and -R<sup>1</sup>Si(R<sup>2</sup>)<sub>3-n</sub>(OH)<sub>n</sub> wherein n is 1, 2 or 3, R<sup>1</sup>  
10 and R<sup>2</sup> are alkyl, alkoxy or alkylene containing up to 6  
carbon atoms, and R in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

55. The method of Claim 52 wherein said  
material is selected from the group consisting of  
15 glassware, optical fiber, and capillaries.

56. The method of Claim 55 wherein said  
material is a fiber optic filament.

57. The method of Claim 49 wherein material  
having a silica gel surface is rendered resistant to  
20 chemical and physical degradation of said surface.

58. The method of Claim 57 wherein said first  
hydrocarbyl substituent is selected from the group  
consisting of phenyl, alkyl containing 1 to 60 carbon  
atoms, monounsaturated alkylene containing 2 to 60  
25 carbon atoms, epoxide and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of -O-,  
-N(R)-, -S-, -C(O)-, -SO<sub>2</sub>-, -C(O)O-, -OC(O)-,  
30 -C(O)N(R)-, or -N(R)C(O)-; wherein the phenyl, alkyl,  
and alkylene are optionally substituted with one or more  
substituents selected from the group consisting of

1 hydroxyl, halogen, cyano, nitro,  $-\text{COOH}$ ,  $-\text{SO}_3\text{H}$ ,  $-\text{N}(\text{R})(\text{R})$ ,  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and  $-\text{R}^1\text{Si}(\text{R}^2)_{3-n}(\text{OH})_n$  wherein  $n$  is 1, 2 or 3,  $\text{R}^1$   
and  $\text{R}^2$  are alkyl, alkoxy or alkylene containing up to 6  
5 carbon atoms, and  $\text{R}$  in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms, and  $\text{R}$  in each  
occurrence is hydrogen or alkyl containing 1 to 6 carbon  
atoms.

59. The method of Claim 57 wherein said  
10 second hydrocarbyl substituent is selected from the  
group consisting of phenyl, alkyl containing 1 to 60  
carbon atoms, monounsaturated alkylene containing 2 to  
60 carbon atoms, epoxide, and derivatives of alkyl or  
monounsaturated alkylene which contain a total of up to  
15 60 carbon atoms and which contain one or more hetero  
linkages selected from the group consisting of  $-\text{O}-$ ,  
 $-\text{N}(\text{R})-$ ,  $-\text{S}-$ ,  $-\text{C}(\text{O})-$ ,  $-\text{SO}_2-$ ,  $-\text{C}(\text{O})\text{O}-$ ,  $-\text{OC}(\text{O})-$ ,  
 $-\text{C}(\text{O})\text{N}(\text{R})-$ , and  $-\text{N}(\text{R})\text{C}(\text{O})-$ ; wherein the phenyl, alkyl  
and alkylene are optionally substituted with one or more  
20 substituents selected from the group consisting of  
hydroxyl, halogen, cyano, nitro,  $-\text{COOH}$ ,  $-\text{SO}_3\text{H}$ ,  $-\text{N}(\text{R})(\text{R})$ ,  
straight or branched alkyl containing 1 to 6 carbon  
atoms, and  $-\text{R}^1\text{Si}(\text{R}^2)_{3-n}(\text{OH})_n$  wherein  $n$  is 1, 2 or 3,  $\text{R}^1$   
and  $\text{R}^2$  are alkyl, alkoxy or alkylene containing up to 6  
25 carbon atoms, and  $\text{R}$  in each occurrence is hydrogen or  
alkyl containing 1 to 6 carbon atoms.

60. A method for treating the surface of an  
article comprising contacting said surface with silanes  
of the formula  $\text{R}^1\text{SiX}_3$  and  $\text{R}^2\text{SiX}_3$ , wherein  $\text{R}^1$  and  $\text{R}^2$  are  
30 hydrocarbyl substituents and  $\text{X}$  is a leaving group,  
provided that  $\text{R}^1$  is longer than  $\text{R}^2$ , under conditions  
whereunder said silanes react at said surface and form a

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1 monolayer of silicon atoms chemically bonded to said  
surface which silicon atoms are connected to other  
silicon atoms in said monolayer through oxygen atoms in  
said monolayer, wherein each of said silicon atoms in  
5 said monolayer is substituted with  $R^1$  or  $R^2$ .

~~62/17~~ The method according to Claim ~~60/16~~ which  
comprises contacting said surface with said silanes in a  
solution of said silanes.

~~62/18~~ The method according to Claim ~~60/16~~ which  
10 comprises contacting said surface of said article with a  
gas comprising said silanes.

~~62/19~~ A method according to Claim ~~62/18~~ wherein  
said article is a fiber optic filament, the method  
comprising drawing said filament through said gas under  
15 conditions whereunder said silanes react with the  
surface of said filament.

~~64.~~ A method for treating a surface  
comprising silicon and oxygen atoms, said surface  
comprising hydroxyl substituents, to remove said  
20 hydroxyl substituents, comprising:

(a) converting said hydroxyl  
substituents to halide substituents, and then

(b) converting said halide substituents  
to alkyl groups containing 1 to 6 carbon atoms.

25 ~~65.~~ The method of Claim 64 wherein said  
halide is chloride.

~~66.~~ The method of Claim 65 wherein said  
hydroxyl substituents are converted to chloride by  
reacting said hydroxyl substituents with thionyl  
30 chloride.

1           67. The method of Claim 66 wherein said  
chloride is converted to alkyl groups by reacting the  
product of step (a) with a Grignard reagent.

5           68. The method of Claim 67 wherein said  
Grignard reagent has the formula  $(\text{Alk})\text{MgBr}$  wherein Alk  
signifies alkyl containing 1 to 6 carbon atoms.

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